Relations between sociocultural pressures and weight control behavior among early adolescent boys

By: Tsz Lun (Alan) Chu, Scott B. Martin, Trent A. Petrie, Christy Greenleaf

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Abstract:

Guided by the biopsychosocial model, we examined (a) the prevalence of weight control behaviors (WCBs; i.e., trying to stay the same weight, lose weight, gain weight, or do nothing about weight) among early adolescent boys by race/ethnicity and grade level, and (b) how the boys' perceptions of sociocultural pressures (from parents, peers, and media) to lose weight, gain weight, exercise, and diet predicted their WCBs while accounting for body composition and grade level. Early adolescent boys (n = 508) in middle schools completed survey measures of WCB and sociocultural pressures and objective assessment of body mass index as body composition. Multinomial logistic regressions revealed that sixth graders were more likely than seventh and eighth graders to be trying to lose weight. Moreover, greater pressure to gain weight and lower pressure to exercise predicted a greater likelihood of trying to gain weight. The significant roles of grade levels and different sociocultural pressures in predicting WCBs suggest that health professionals and school staff should consider these factors when intervening with early adolescent boys.

Keywords: adolescent boys | biopsychosocial model | body composition | sociocultural pressures | weight control behavior

Article:

1 INTRODUCTION

Weight concerns are common during adolescence when body changes occur, and often result in different attempts to manage weight. Attempts to lose, gain, stay the same, or do nothing about weight can be referred to as an individual's weight control behavior (WCB; Yeatts, Martin, Petrie,

& Greenleaf, 2016). Although there is extensive literature on perceived sociocultural pressures and WCB among adolescent girls (e.g., Fryar, Carroll, & Ogden, 2016), research on adolescent boys has lagged (McCabe, Ricciardelli, & Holt, 2010). Further, there is inconsistent evidence of the prevalence of boys trying to lose or gain weight (McCabe & Ricciardelli, 2004). For example, although past research has indicated that a large proportion of adolescent boys have a desire to be more muscular in terms of muscle tone and size (Smolak, Murnen, & Thompson, 2005), the US 1999–2009 Youth Risk Behavior Survey (YRBS) revealed increases (from 26.1% to 30.5%) in the prevalence of adolescent boys trying to lose weight and decreases (from 29.5% to 26.2%) in the prevalence of boys trying to gain weight (Demissie, Lowry, Eaton, & Nihiser, 2015). Trends of greater attempts to lose weight in this population might be attributed to the increased obesity rates among boys aged 6–19 years (Fryar et al., 2016) and the greater sociocultural pressures (from parents and peers) to lose weight due to a heavier body size and weight. Thus, additional research is needed to examine specific factors associated with boys' WCBs.

1.1 Biopsychosocial model

Ricciardelli and colleagues (Ricciardelli & McCabe, 2004; Ricciardelli, McCabe, Holt, & Finemore, 2003) proposed a biopsychosocial model to understand boys' body image concerns and WCBs. In the model, they identified biological (e.g., age), psychological (e.g., weight perception), and sociocultural (e.g., pressures from parents, peers, and media) factors that may influence children's WCBs, and suggested that age may also influence inclinations to lose or gain weight (Ricciardelli & McCabe, 2004; Ricciardelli et al., 2003). During puberty, boys experience noticeable biological changes, such as increases in muscle mass (Smolak et al., 2005), which may contribute to their knowledge and perceptions of the ideal male body (i.e., lean and muscular). Consequently, this increased awareness as a result of increased age (and possibly maturation) was positively related to both weight gain and weight loss strategies used by early adolescents (Martin et al., 2014; Muris, Meesters, van de Blom, & Mayer, 2005).

Body composition, often measured in body mass index (BMI), is another biological factor that influences boys' WCBs (Ricciardelli & McCabe, 2004). Although it is reasonable to assume that overweight and obese boys would try to lose weight and underweight boys would try to gain weight to reach a healthy weight, boys with similar body composition may experience different sociocultural pressures to change their weight and thus exhibit inconsistent WCBs. For instance, healthy-weight boys may experience pressures both to gain muscles and lose weight due to a societal desire to achieve the muscular ideal (Blashill & Wilhelm, 2014; Martin et al., 2014; Ricciardelli & McCabe, 2004), so they may alternate between trying to lose and gain weight. Indeed, McCabe, Ricciardelli, and Karantzas (2010) found that even healthy-weight boys experienced moderate-to-high levels of sociocultural pressures to both lose weight and gain muscles as overweight boys did. Moreover, Lyles (2014) interviewed middle school boys and found that healthy-weight boys had similar concerns about their body shape and perceived importance of their weight as overweight and obese boys did. There exists a higher percentage of overweight and obese boys than girls in the United States (Fryar et al., 2016), so examining the relationship between body composition and WCB may be particularly relevant for boys.

With respect to psychological factors, it is important to understand that boys and girls have different weight concerns and perceptions. Almost all adolescent girls are concerned about weight gain, whereas adolescent boys are equally split between being concerned about weight gain and weight loss (McCabe & Ricciardelli, 2004). Even among boys who have a healthy weight, some

may view themselves as overweight and try to lose weight, whereas some may view themselves as underweight and try to gain weight, primarily muscle mass. Both of these weight perceptions can lead to body dissatisfaction and elevated levels of depression symptoms (Blashill & Wilhelm, 2014). Controlling for weight status, middle school boys who tried to lose weight were found to have lower psychological well-being than those who tried to gain weight, maintain weight, or do nothing about their weight (Yeatts et al., 2016). In contrast, high school boys who perceived themselves as underweight and tried to gain weight experienced increased depressive symptoms and victimization, which was in turn associated with steroid use (Blashill 2014). Therefore, attempts to gain or lose weight could be related to increased use of unhealthy weight change strategies and reduced psychological well-being.

1.2 Race/ethnicity

Race/ethnicity is a social factor that is hypothesized to influence boys' WCBs within the biopsychosocial model (Ricciardelli & McCabe, 2004), since different racial/ethnic groups may have different ideal male physiques. Some racial/ethnic groups might prefer a heavier body type, whereas other groups might prefer a lighter one. For instance, African American boys tend to view large physiques more positively than their White counterparts (Nollen et al., 2006; Park, 2011). Conversely, White boys tend to have more accurate weight perceptions than non-White boys (Martin et al., 2014), so they may prefer less heavy body type and to maintain or do nothing about weight.

In contrast, research on a racially/ethnically diverse middle school sample showed that non-White boys were more likely to engage in strategies to lose weight than their White counterparts (Austin et al., 2013); African Americans had the highest, and Hispanics the next highest, likelihood of using strategies to lose weight. Non-White boys' primary WCB to lose weight was attributed to their higher overweight and obesity rates than White boys (Martin et al., 2014). Due to racial/ethnic differences and conflicting evidence between weight perceptions and obesity rates, additional evidence of WCBs across distinct groups is needed to provide more accurate information about adolescent boys' body image and weight management concerns (Demissie et al., 2015).

1.3 Sociocultural pressures

Perceived sociocultural pressures, a psychosocial variable, is related to concerns about weight and body shape among adolescent boys (Ricciardelli & McCabe, 2004). Boys are often interested in becoming more muscular as a result of the ideal male physique in western culture, which leads to pressures to manage weight. These pressures to manage weight can be categorized into sources (i.e., family, friends, and media) and areas (i.e., lose weight, gain weight, exercise, and diet). Muris et al. (2005) found that for adolescent boys in the Netherlands, the pressure to lose weight predicted dieting problems (e.g., avoiding eating when hungry), and pressure to gain weight predicted disordered eating for muscle development (e.g., eating binges). The literature further suggests that sociocultural pressures are not only limited to weight loss and weight or muscle gain, but also include pressures to change body shape through methods such as exercise or diet (McCabe & Ricciardelli, 2004). To control weight, approximately 95% of overweight and 97% of nonoverweight boys in the United States used exercise; 73% and 46%, respectively, ate less food (Ojala et al., 2007). However, little research has considered exercise and diet in evaluating different

areas of sociocultural pressures. Stanford and McCabe (2005b) made the first attempt to examine the influence of sociocultural messages related to food, exercise, shape, weight loss, and muscle gain on Australian boys' strategies to lose weight and to gain muscles. Messages about food predicted both strategies to lose weight and to gain muscles, whereas messages about exercise predicted mostly strategies to lose weight. Because exercise and dietary change can be used to maintain, lose, or gain weight, examining their corresponding sociocultural pressures, as well as their potential interactions, would provide meaningful information about the sociocultural factors within the biopsychosocial model. Further empirical findings regarding these sociocultural factors could inform intervention strategies for working with boys across different racial/ethnic groups who have various sociocultural pressures to manage weight.

1.4 The current study

Based on the biopsychosocial model (Ricciardelli & McCabe, 2004; Ricciardelli et al., 2003), the overall purpose of our study was to examine the WCBs among middle school boys with two research questions. First, what were the relations of racial/ethnic groups and grade levels to the prevalence of WCBs to stay the same weight, lose weight, gain weight, or do nothing, respectively? Second, how did sociocultural pressures to lose weight, gain weight, exercise, and diet predict WCB group membership over and above the effects of grade level and body composition (measured using BMI)?

Based on our literature review, we developed three hypotheses in relation to the research questions. First, we hypothesized that a significantly larger ratio of non-White boys than White boys would be trying to lose weight rather than to gain weight, maintain weight, or do nothing about weight. Second, we hypothesized that BMI would predict a higher likelihood of WCB to lose weight and a lower likelihood of WCB to gain weight. Third, we hypothesized that after accounting for BMI and grade level, greater pressure to lose weight would predict a higher likelihood of WCB to lose weight, whereas greater pressure to gain weight would predict a higher likelihood of WCB to gain weight. We further explored the contribution of pressures to exercise and to diet without a priori hypotheses in this study due to a lack of literature support. In addition, we tested the interactions between the biological and sociocultural factors for potential moderating effects.

2 METHODS

2.1 Participants

Participants were 508 adolescent boys attending one of the six middle schools in a suburban school district in the southwestern United States. The participants ranged in age from 10 to 15 years ($M_{age} = 12.32$ years, $SD = 0.93$); 40.6% were in sixth, 33.8% in seventh, and 25.6% in eighth grade. In terms of self-reported race/ethnicity, 65.5% were White and 34.5% were non-White (22.2%, Hispanic or Latino; 8.9%, African American; and 3.4% other). Federal guidelines for free or reduced lunch based on family income indicated that 43.1% of participants were economically disadvantaged (received free lunches or reduced lunches). This sample was representative of the school district population in terms of race/ethnicity and socioeconomic status.

2.2 Procedures

First, we obtained approval from the university's Institutional Review Board for conducting the study in the academic year of 2010–2011. With permission of the school district administration and middle school principals, we obtained parental consent and child assent before data collection. As a part of a larger study on the physical and mental health of middle school students, participants completed a survey packet and a statewide fitness assessment. The two-part survey including our study measures took approximately 45 min to complete over two separate physical education class periods.

2.3 Measures

2.3.1 Sociocultural pressures

The 12-item Perceived Sociocultural Pressures Scale (Petrie, Greenleaf, & Martin, 2010) was adapted from Stice and Agras (1998) original work1 to assess perceived pressures to lose weight, gain weight and have bigger muscles, exercise, and diet from three different sources—family, friends, and the media—on a scale of 1 (none) to 5 (a lot). One example item is "I have felt pressure from my family to lose weight." A total score was calculated for each pressure using the mean of the three sources; higher scores indicated greater perceived pressures. This modified measure has been shown to have good internal reliability and predictive validity in early adolescents (Greenleaf, Petrie, & Martin, 2015; Petrie et al., 2010). Cronbach's αs of the four subscales indicated acceptable internal consistency ($\alpha > 0.70$; Nunally, 1978) in this study (see Table 1).

Table 1. Means, standards deviations, and correlations for perceived sociocultural pressure and BMI

Variables	*M*	*SD*	1	2	3	4	5
1. PSPS lose weight	1.38	0.74	(0.86)				
2. PSPS gain weight	1.67	0.81	0.46**	(0.72)			
3. PSPS exercise	1.72	0.87	0.63**	0.61**	(0.75)		
4. PSPS diet	1.35	0.72	0.83**	0.54**	0.66**	(0.84)	
5. BMI	21.20	4.60	0.44**	0.05	0.21**	0.35**	–

Note. Cronbach's α of each sociocultural pressure subscale is listed on the diagonal.
BMI: body mass index; PSPS: perceived sociocultural pressure scale.
** $p < 0.001$.

2.3.2 WCB

An item from the national YRBS (Kann et al., 2016) administered by the Centers for Disease Control and Prevention was used to categorize WCB. Participants answered the question "Which of the following best describes what you currently are trying to do about your weight?" by selecting one of four options: stay the same weight, lose weight, gain weight, and not trying to do anything about my weight (i.e., do nothing).

2.3.3 Body composition

Body composition was assessed with BMI, calculated using objective height and weight data measured by physical education teachers. Height was measured in inches and weight was

measured in pounds, which were converted to kilograms and meters, respectively, for the BMI calculation (kg/m2).

2.4 Data analysis

There were minimal missing data, with items missing from 0% and 1.9% across the study measures. With data missing completely at random, we used the expectation–maximization algorithm to replace the missing values (Graham, 2009). The examination of distributional properties (e.g., kurtosis and skewness) showed that all measures were within acceptable ranges (between –2 and 2), so we used the original nontransformed data for analysis. In the preliminary analyses, we computed descriptive statistics and correlations for all study variables. We then conducted a series of Pearson $\chi 2$ tests of independence, with two resulting contingency tables for comparing the prevalence of the four WCB groups by race/ethnicity and grade level. Bonferroni corrected p values of 0.0065 (0.05/8) and 0.0042 (0.05/12) were used to determine the significant comparison by race/ethnicity and grade level, respectively, based on their standardized adjusted residuals (García-Pérez & Núñez-Antón, 2003).

To determine which sociocultural pressures were predictors of the WCB groups, we conducted multinomial logistic regression analyses with "do nothing" as the reference group. Continuous variables were centered to the mean scores to investigate potential moderators in the regression models. We performed six hierarchical regression models in sequence based on the biopsychosocial model: (a) Grade level and BMI were entered as potential biological predictors; (b) the two-way interaction term of grade level and BMI was entered to examine any moderating effects; (c) sociocultural pressures were entered to assess their contribution over and above biological factors; (d) the two-way interaction terms of BMI and sociocultural pressures were entered to examine any moderating effects; (e) the two-way interaction terms of grade level and sociocultural pressures were entered to examine any moderating effects; (f) the three-way interaction terms of BMI, grade level, and sociocultural pressures were entered to examine any moderating effects. We further determined the statistical significance of each additional step and associated predictors by comparing the overall model fit ($\chi 2$) of the current model with the previous significant model computed in the likelihood ratio test, using p values of 0.01 to reduce the likelihood of Type I errors. Nagelkerke's pseudo R2 (RN2) was used to indicate the effect size of a model with a maximum value of 1.00, analogous to the squared multiple correlation in ordinary least squares regression. However, RN2 does not refer to the "variance", but the "null deviance" explained by the predictors and is generally smaller in magnitude, as compared to squared multiple correlation (Hosmer & Lemeshow, 2000). More detailed explanations for the differences between RN2 and squared multiple correlation can be found in Cohen, Cohen, West, and Aiken (2003, pp. 502–504).

3 RESULTS

The middle school boys in this study had relatively low mean scores (<2 of 5 points) in all areas of sociocultural pressures. The correlations among pressures and BMI were all significant and positive except between pressure to gain weight and BMI (see Table 1). Boys who perceived greater pressure in one area also generally perceived greater pressure in other areas, especially pressure to lose weight and pressure to diet, which had the highest correlation ($r = 0.83$). Due to this high correlation, of the two, we included only pressure to diet in the logistic regression

analyses. This decision was supported by both statistical reasoning (O'Brien, 2007) and theoretical reasoning that dieting was the most commonly reported strategies to lose weight among boys (Ricciardelli & McCabe, 2001).

With regard to the prevalence of WCBs, there were 123 boys (24.2%) trying to stay the same weight, 143 boys (28.1%) trying to lose weight, 94 boys (18.5%) trying to gain weight, and 148 boys (29.1%) not trying to do anything about their weight. Table 2 shows the proportion of the four WCBs across race/ethnicity and grade levels. Pearson $\chi 2$ tests of independence showed the significant comparison of WCB groups by race/ethnicity ($\chi 2 = 17.93$, $p = 0.0005$), but not by grade level ($\chi 2 = 7.97$, $p = 0.24$). A larger proportion of non-White than White boys were trying to lose weight, whereas a larger proportion of White than non-White boys was not trying to do anything about their weight.

Table 2. Contingency table of weight control behavior groups by race/ethnicity and grade level

	Racial/ethnicity		Grade level		
	Non-White ($n = 175$)	White ($n = 333$)	6th grade ($n = 206$)	7th grade ($n = 172$)	8th grade ($n = 130$)
Stay the same weight					
% (n)	19.4% (34)	26.7% (89)	22.3% (46)	26.2% (45)	24.6% (32)
Adj. z	–1.82	1.82	–0.82	0.73	0.12
Lose weight					
% (n)	**38.3% (67)**	**22.8% (76)**	30.1% (62)	30.8% (53)	21.5% (28)
Adj. z	**3.68**	**–3.68**	0.81	0.96	−1.94
Gain weight					
% (n)	20.6% (36)	17.5% (58)	19.4% (40)	13.4% (23)	23.8% (31)
Adj. z	0.87	–0.87	0.44	–2.13	1.82
Do nothing					
% (n)	**21.7% (38)**	**33.0% (110)**	28.2% (58)	29.7% (51)	30.0% (39)
Adj. z	**–2.67**	**2.67**	–0.40	0.18	0.25

Note. Significant comparisons ($p < 0.0065$) by race/ethnicity are bolded.
Adj. z: adjust standardized residual.

Table 3 presents the results of the six multinomial logistic regression models. The first baseline model was significant, $\chi 2\ (12) = 266.41$; with BMI and grade level explaining about 44% ($RN2 = 0.44$) of the null deviance in predicting WCBs. Adding the interaction of BMI and grade level in Step 2 did not improve the model fit significantly, $\Delta\chi 2\ (6) = 3.69$, $p = 0.72$. Therefore, the interaction term was not included in Step 3. The addition of three sociocultural pressures in Step 3 improved the model fit significantly, $\Delta\chi 2\ (3) = 45.38$, $p < 0.001$; the pressures explained about 5% of the null deviance ($\Delta RN2 = 0.05$) in predicting WCBs over and above BMI and grade level. Adding the interaction terms between biological and sociocultural factors in Step 4, $\Delta\chi 2\ (9) = 19.60$, $p = 0.04$; Step 5, $\Delta\chi 2\ (18) = 14.51$, $p = 0.70$; and Step 6, $\Delta\chi 2\ (27) = 37.56$, $p = 0.09$, did not improve the model fit significantly; thus, Model 3 was the final model for interpretation of the findings.

Model 3 demonstrated that BMI and grade level were significant predictors of the WCB to lose or gain weight, but not to stay the same weight. Specifically, compared to not trying to do anything about their weight, (a) boys with a higher BMI were more likely to be trying to lose weight and boys with a lower BMI were more likely to be trying to gain weight; (b) sixth-grade

Table 3. Multinomial logistic regression analysis in predicting weight control behavior

	Stay the same weight (n = 123)		Lose weight (n = 143)		Gain weight (n = 94)	
Predictors	**Exp(*B*)**	**95% CI**	**Exp(*B*)**	**95% CI**	**Exp(*B*)**	**95% CI**
Model 1, $\chi 2$ (12) = 266.41**; RN2 = 0.44						
BMI	1.05	0.97, 1.14	1.49**	1.36, 1.62	0.70**	0.62, 0.80
6th Grade	1.07	0.57, 2.00	3.85**	1.80, 8.24	0.50	0.25, 0.98
7th Grade	1.12	0.60, 2.09	1.85	0.87, 3.92	0.41	0.20, 0.84
8th Grade	1.00		1.00		1.00	
Model 2, $\chi 2$ (15) = 270.10**; RN2 = 0.44						
Model 3, $\chi 2$ (18) = 315.48**; RN2 = 0.49						
BMI	1.05	0.97, 1.14	1.45**	1.33, 1.58	0.70**	0.61, 0.80
6th grade	1.12	0.59, 2.13	3.61*	1.63, 7.97	0.46	0.23, 0.94
7th grade	1.20	0.64, 2.24	1.97	0.90, 4.28	0.42	0.19, 0.90
8th grade	1.00		1.00		1.00	
PSPS gain weight	1.46	0.93, 2.31	0.91	0.53, 1.57	4.04**	2.37, 6.87
PSPS exercise	1.03	0.69, 1.53	0.98	0.60, 1.61	0.39**	0.23, 0.68
PSPS diet	0.96	0.54, 1.71	2.24	1.18, 4.27	1.00	0.51, 1.96
Model 4, $\chi 2$ (27) = 333.08**; RN2 = 0.51						
Model 5, $\chi 2$ (36) = 329.99**; RN2 = 0.51						
Model 6, $\chi 2$ (45) = 353.04**; RN2 = 0.54						

Note. The reference category is "do nothing." Only predictors in the models with significant ΔRN2 are displayed.
BMI: body mass index; PSPS: perceived sociocultural pressures scale; RN2: Nagelkerke's pseudo R2.
* $p < 0.01$.
** $p < 0.001$.

boys were approximately 3.6 times more likely to be trying to lose weight; (c) boys with greater pressure to diet were approximately 2 times more likely to be trying to lose weight; (d) boys with greater pressure to gain weight were about 4 times more likely to be trying to gain weight; and (e) boys with greater pressure to exercise were approximately 2.5 times less likely to be trying to gain weight. There was a modest overall correct classification rate of 50.6%. The correct classification rates of the WCB groups were 13.0% in "stay the same weight," 76.2% in "lose weight," 54.3% in "gain weight," and 54.7% in "do nothing." Thus, the prediction is the most accurate for trying to lose weight and the least accurate for trying to stay the same weight.

4 DISCUSSION

This study examined the prevalence of the four WCB groups (i.e., stay the same weight, lose weight, gain weight, and do nothing) by considering demographic factors among early adolescent boys, and further predicted the likelihood of WCBs due to sociocultural pressures to lose weight, gain weight, exercise, and diet. The prevalence of the four WCBs was relatively equal among the early adolescent boys. Overall, the boys perceived minimal sociocultural pressures to lose weight, gain weight, exercise, and diet (Ms = 1.35–1.72). This finding supports previous research evidence of low sociocultural pressures (Ms = 1.22–2.47) among early adolescent boys in Australia (Stanford & McCabe, 2005b). One plausible explanation is that early adolescent boys have less weight- and muscularity-related conversations and concerns than middle and late adolescent boys (Jones & Crawford, 2005; Yuan, 2010).

The correlation analyses produced an unexpected pattern of positive correlations among all four sociocultural pressures, especially between the pressures to lose weight and to gain weight. Thus, boys who experienced greater pressure to lose weight also experienced greater pressure to gain weight in general. Although this seems counterintuitive, previous research has shown that early adolescent boys experience pressures to achieve their ideal, muscular physique, which results in attempts to gain weight and muscles for leanness (Ricciardelli & McCabe, 2004). Some healthy-weight or even overweight boys experience pressure to gain weight and muscles, in addition to pressure to lose weight, in their pursuit of masculinity (McCabe et al., 2010). For instance, an overweight athlete might be pressured not only to gain muscle mass for greater body size but also to shed excess fat for greater speed to meet the physical demands of a sport.

Our first hypothesis is supported concerning the racial/ethnic group differences in the prevalence of WCBs. One reason for a significantly larger proportion of non-White than White boys trying to lose weight is that the majority of the non-White boys in our sample were Hispanic or African American, the two racial/ethnic groups with the highest overweight and obesity rates (Fryar et al., 2016). In addition to lower overweight and obesity rates (Fryar et al., 2016), White boys have more accurate weight perceptions than non-White boys in general (Martin et al., 2014), which explains a larger proportion of them not trying to do anything about their weight than non-White boys. The comparison of WCBs by grade level yielded similar findings to the recent middle school YRBS data of most states (Kann et al., 2016), showing no significant differences in the prevalence of WCBs among boys across sixth to eighth grades.

To further answer our first research question, results suggest that grade level is associated with the likelihood of the WCB to lose weight. In line with previous research findings (Austin et al., 2013), sixth-grade boys were more likely to be trying to lose weight than eighth-grade boys. This result is consistent with previous research based on the biopsychosocial model, which indicates that older adolescent boys have more muscularity concerns than boys in early puberty

(Jones & Crawford, 2005), and thus older boys are more likely to be trying to gain weight or muscles than to lose weight (Ricciardelli & McCabe, 2004). Research evidence also supports that boys increase muscularity concerns and use muscle building strategies to gain weight or muscles during seventh and eighth grades (Smolak & Stein, 2010). School staff and health professionals should pay special attention to middle school boys who are trying to gain weight, especially those in sixth grade and misperceive themselves as underweight, in order to intervene early and help the boys improve body image and adopt appropriate weight management strategies.

The results of the logistic regression analyses provide evidence for our second research question. Supporting our second hypothesis and the literature (McCabe & Ricciardelli, 2003; Muris et al., 2005; Ricciardelli & McCabe, 2004), a higher body composition contributed to a higher likelihood of the WCB to lose weight and a lower likelihood of the WCB to gain weight. In contrast, the third hypothesis is partially supported. In line with the biopsychosocial model (Ricciardelli & McCabe, 2004; Ricciardelli et al., 2003), boys with greater pressure to gain weight were much more likely to be trying to gain weight than not trying to do anything about their weight. Boys with greater pressure to exercise were more than twice less likely to be trying to gain weight than not trying to do anything about their weight. Pressure to exercise, therefore, might not be seen by early adolescent boys as a need to gain weight. Instead, There is a possibility that boys trying to gain weight would experience pressure to use other unhealthy weight management strategies, such as the use of food supplements and binge eating. Parents and health professionals should look for warning signs of unhealthy strategies used by these boys.

Unexpectedly, and contrary to the third hypothesis pressures to diet did not significantly predict the likelihood of WCBs. This nonsignificant finding may be attributed to high overweight and obesity rates among adolescent boys in our sample as well as in the US population, such that those not trying to do anything about their weight may also experience similarly high pressure to diet (Duan, Vidot, & Hlaing, 2014). Pressure to diet should be explored in other populations (e.g., girls, other age groups) with other reference groups to further our understanding of its potential contribution to WCBs. Regarding the accuracy of the WCB group prediction, the highest correct classification rate was found in the WCB to lose weight, because the weight concerns of boys trying to lose weight are more predictable and consistent (McCabe et al., 2010; Muris et al., 2005). In contrast, the lowest correct classification rate was found in the WBC to stay the same weight. It seems reasonable that these boys may perceive different types and magnitudes of sociocultural pressures, and thus are harder to classify accurately.

4.1 Strengths and limitations

The strengths of this study include the use of objectively measured height and weight data for BMI instead of subjective self-report items (McCabe et al., 2010). Additionally, we used four WCB groups by including the WCB to stay the same weight or do nothing, which provided additional information beyond solely focusing on the WCB to lose or gain weight (Smolak & Stein, 2010; Smolak et al., 2005). Because the purpose of the study was to understand boys' current attempts to control weight, this measure provided a clear categorization of what boys were trying to do about their weight. Our study was also one of the few in the current literature that assessed different areas of sociocultural pressures by including pressures to exercise and to diet (e.g., Anderson, Petrie, & Neumann, 2011). This inclusion provided further evidence of the predictive utility and reliability of this multidimensional measure and added knowledge to various sociocultural factors within the biopsychosocial model (Ricciardelli & McCabe, 2004). Furthermore, the logistic

regression models revealed large effect sizes that accounted for about half of the null deviance in WCB. This effect demonstrated the practical significance of considering BMI, grade level, and sociocultural pressures in predicting WCBs.

There are several study limitations that should also be addressed. First, boy's WCB was assessed with only one self-report item, which was subject to short-term changes. Boys could possibly change their WCB to the opposite direction at different times, such as trying to gain weight in the winter and to lose body fat in the summer, to achieve their long-term ideal physique. Future studies may employ a longitudinal research design by collecting data at multiple time points to keep track of the changes in boys' WCB throughout the year and to examine the stability of this measure. Moreover, the WCB item did not represent the actual weight change in this cross-sectional study, so casual relationships could not be developed. Longitudinal or prospective studies that assess the actual weight change are needed to determine the causal effects of sociocultural pressures. Additionally, investigating boys' reasons and strategies related to their WCB would be important, because weight management strategies can be healthy or unhealthy. Other potential factors related to WCB that need further examination include ideal body type (e.g., using photographs to establish a frame of reference), sports involvement, and the onset of puberty (McCabe & Ricciardelli, 2004; Ricciardelli & McCabe, 2004). For instance, early-maturing boys tend to use more strategies to lose weight and gain muscles than late-maturing boys, whereas late-maturing boys are more likely to experience body dissatisfaction and develop exercise dependence than early maturing boys.

Another limitation of this study is related to the measure of sociocultural pressures. Although the measure of pressures to diet and to exercise has been shown reliable in this population (Greenleaf et al., 2015; Petrie et al., 2010), there might be shared method variance in assessing pressures to exercise or diet along with pressures to lose or gain weight, which caused the relatively high intercorrelations in this study. As a result, we removed the pressure to lose weight in the logistic regression analyses. In addition, the total effect size of three other sociocultural pressures in the prediction of WCBs was relatively small ($RN2 = 0.05$). To account for the variance not explained by the pressures to gain weight, to exercise, and to diet, we suggest further attempts be made to explore other areas of sociocultural pressure that do not overlap with the current measure. Finally, our sample is predominantly White and from only one regional school district, so the prevalence of WCB across race/ethnicity could not be generalized from our findings. Future research may examine specific ethnic minorities in the United States or other countries to shed light on potential differences in the roles of sociocultural pressures. Qualitative studies are also needed to investigate individual differences to facilitate evidence-based weight management interventions for all adolescent boys by addressing their WCB in relation to biological and sociocultural factors (Lyles, 2014). Triangulation of data sources can be used to understand not only boys' perception of sociocultural pressures but also parents' perception of boy's pressures so as to help parents and health professionals understand the consequences of WCBs and the sources of sociocultural pressures.

Keeping these limitations in mind, our research findings offer a new perspective on how pressures to exercise and to diet might be different from pressures to lose weight and to gain weight. Future investigations may refine the measure of sociocultural pressures by including specific indicators about diet (e.g., fasting, eating more fruits, and vegetables) and exercise (e.g., aerobic exercise and weight training) to assess pressures to engage in different dieting and exercise behaviors. Due to the exploratory nature of this study with multiple sociocultural pressures, psychological moderators and mediators were not tested. Integrating the tripartite influence model

of body dissatisfaction (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999) and the biopsychosocial model will allow future research to test for mediations and moderations when predicting WCB. For instance, social comparison and internalization of ideal physique can be tested as mediators, and self-esteem and negative effect can be tested as moderators. Examining these relationships may contribute to a more comprehensive understanding of boys' sociocultural pressures from different internal and external sources.

4.2 Implications

Regardless of body composition, early adolescent boys who experience pressure to gain weight may engage in weight gain behaviors that are potentially unhealthy. Boys who are in sixth grade and have a higher body composition may be more susceptible to trying to lose weight, whereas boys who have a lower body composition and experience greater pressure to gain weight may be more susceptible to trying to gain weight. In practice, health professionals who work with early adolescent boys should be informed by the biopsychosocial factors, such as boys' grade level and perceived sociocultural pressures related to their weight management attempts. Sociocultural factors, such as these, can be addressed in intervention programs through discussions on weight-related behaviors of boys' family and peers, as well as their personal concerns about weight and body shape (Irving & Neumark-Sztainer, 2002). Stanford and McCabe (2005a) developed a body image prevention program that was successful in improving body satisfaction, self-esteem, and affect for seventh-grade boys. However, McCabe et al. (2010) designed a similar body image and self-esteem intervention program that was ineffective in improving body image among boys from seventh to ninth grades. Based on the findings of the current study, addressing grade level differences seems to be critical in enhancing the effectiveness of these interventions. Specifically, healthy weight loss and body perceptions may need to be underscored for sixth-grade boys, whereas healthy weight gain and muscularity concerns may be important to emphasize for eighth-grade boys. Additionally, school staff should assess boys' behaviors and level of risk, as well as screen for "outliers" who have different weight concerns than the majority of boys in their grade level, before introducing intervention programs to individuals.

Pressures to manage weight can contribute to body dissatisfaction through dual pathways—one pathway focuses on weight concerns and the other centers on muscularity (Jones & Crawford, 2005; Petrie et al., 2010). Thus, parents and health professionals ought to convey positive messages to early adolescent boys about appropriate body perceptions and weight management strategies with considerations of the source of sociocultural pressures for different boys (see Voelker, Reel, & Greenleaf, 2015). For example, health professionals can provide evidence-based information regarding the use of regular physical activity and healthy eating instead of short-term exercise and dieting strategies for weight management. As highlighted by the biopsychosocial model, sports participation may be an important protective factor for boys as it can help them develop a positive body image through healthy weight management (Ricciardelli & McCabe, 2004). In agreement with Irving and Neumark-Sztainer (2002), we recommend that a broad spectrum of weight concerns and WCBs be assessed and addressed in intervention programs. In addition, interventions should include parents to help them understand their sons' body perceptions and sociocultural pressures. Since weight management interventions recently began to target adolescent boys (Voelker et al., 2015), continual evaluation of these programs across demographic factors (e.g., race/ethnicity and socioeconomic status) is necessary.

In addition to the efforts of health professionals, school staff can help facilitate healthy weight management through educational programs. School is a critical environment that can contribute to or protect against WCBs, especially during middle school years (Austin et al., 2013). Therefore, middle school teachers need to be aware of students who experience excessive pressures to manage weight and refer them to school counselors or health professionals deemed necessary. To promote positive body images, teachers can use information from social media as an effective strategy to enhance self-esteem and peer support among middle school students (Yager, Diedrichs, Ricciardelli, & Halliwell, 2013). Further, parents and teachers may educate boys on how to handle societal pressures regarding the pursuit of unrealistic muscularity. Through collaborations among parents, health professionals, and school staff, adequate weight perceptions and weight management among early adolescent boys can more likely be achieved.

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